Enhancing the Sense of Other Learners in Student-Centred Web-Based Education

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Abstract

Student-centred learning can be used in Web-courses to increase student activity, motivation and commitment. EDUCO is a system for student-centred learning, both for the learners and the teachers. Students can use EDUCO within a standard web-browser to navigate towards useful information and Web-resources gathered into the system. The key issue is that every participant can see everyone else in the system and their navigational steps, so that the feeling of student companions taking part in the same tasks is increased. The implications of this type of social navigation are discussed along with the description of the system itself.

1. Introduction

Emerging trends in higher education include a shift from traditional, teacher-oriented lecturing towards student-centred learning (SCL). SCL means that communicating course material does not rest solely on the shoulders of a teacher (see e.g. [4]). A wide variety of different teaching and learning approaches fall into the category of SCL. Examples include active learning, project-based learning, problem-based learning, case-based learning, and even more recent approaches such as learning by research.

Learning tasks in SCL include such techniques as substituting active learning experiences for lectures, holding students responsible for material that has not been explicitly discussed in class, assigning open-ended problems which require both critical and creative thinking, and using self-paced cooperative learning. The research findings of educational literature prove convincingly that, properly implemented, SCL fosters motivation and elicits a deeper understanding toward the subject being taught [4, 5, 3].

At the same time, another trend witnessed in higher education has been to promote Web-based education. The potential benefits of Web-based education are tempting, but producing effective Web-courses has proven to be resource-intensive; relying on pre-made learning materials and/or on-line lectures or tutoring have been costly activities, yet the learning outcome has often been less than desired. However, SCL can be integrated into Web-based education with significant success, if the tools and course assignments used are designed to support student-centred activities during the course. Student-centred principles are building blocks for computer-supported collaborative learning [1]. The paper describes EDUCO, a system to be used as a learning platform in Web-courses with an emphasis towards SCL. To make the students more aware of other students' actions in the environment, EDUCO incorporates the concept of *social navigation* [9].

In their seminal book about social navigation, Munro et al. [9] use an on-line grocery store as an example when classifying different types of social navigation: if people visiting the store are given recommendations about what other people have bought, it is a form of indirect social navigation. If a shopper in the grocery store has a sense of other people moving about the store and can engage in seeking e.g. assistance, it is a case of direct social navigation. Experiments with social navigation in educational settings have mostly fallen into the category of indirect social navigation (see e.g. [2]). A key issue in EDUCO is to employ real-time direct social navigation to create the feeling of live learning companions in the system [8] and to add to the sense of a learning community.

2. EDUCO tool

An example of a Web-course could be as follows. The teacher has picked out several research articles on the course

topic. The course has different topics for each week. A weekly assignment means that the students have to form a group to prepare a report on the subject. The students can use some of the research articles as a starting point for the reports. The reports constitute the course portfolio covering the course contents, maybe along with a learning diary where the students have reflected their learning process during the weekly reports. This type of a course uses many of the typical methods of SCL: preparing a report is an active experience compared to lectures, students are responsible for material that has not been explicitly discussed in class, and producing a report on a topic is an open-ended problem to be tackled in groups.

2.1. Social navigation functions in EDUCO

EDUCO can be used for the SCL course described above. Of course, many other variations and different courses can be fitted into EDUCO as well. The idea of not relying on pre-made course material and use research articles and other versatile resources is present in EDUCO's **map of documents** (Fig. 1, upper left corner). It is obvious that the map can consist of typical course material as well, but the idea of social navigation is lost if everybody has to master every document gathered into EDUCO's map.

The map of documents presents documents currently available in the environment and provides a way to navigate to them directly. By double clicking a document a user can open it in the rightmost frame in the browser window, as seen in Fig. 1. A user is represented as a coloured dot around the document he or she is currently viewing. Other users are visible to every user in real-time, so that their navigation is visible to everyone present.
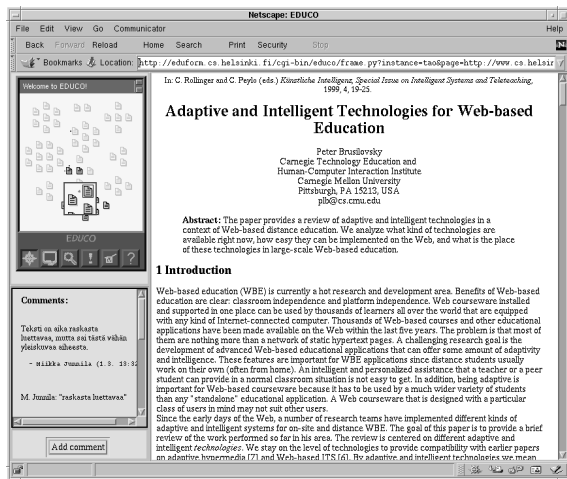

Figure 1. EDUCO user interface showing Map view, open document and related comments.

The colour of a dot indicates a group membership. This type of group membership is assigned by the teacher or course administrator and is independent of the groups the students form. An example of grouping could be teachers, tutors, observers, and students. Another suitable way to differentiate students could be to use their aims and learning strategies for the course. By representing different groups with different colours, the participants have one additional source of information they can use when selecting their study partners or teams for group work.

The documents change their brightness level and colour on the map depending on how much they have been viewed relative to the other documents, as seen in Fig. 2. The total time all users have spent viewing each document is recorded every hour. The change in the brightness and in the colour of an individual document are determined by the distance of its moving average for the last 24 hours from the same average for all documents.
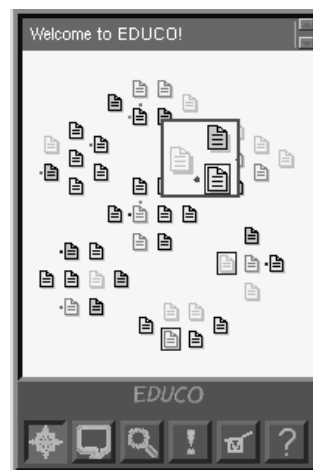

Figure 2. Map view.

Map view provides the users of EDUCO with two essential features of social navigation. Colouring the documents according to how much they have been viewed is a form of indirect social navigation. Presenting users as moving dots next to the documents they are currently viewing is a form of direct real-time social navigation. Both of these features can help the users to follow the footsteps of others. The direct social navigation also adds to the sense of not being alone in a web-course. Research on workspace awareness has notified this as an important issue in different forms of groupware (see e.g. [10]).

Even though the navigation of others is visible to the other participants, initiating the communication between the students also has to be made as simple as possible. EDUCO has a built-in **chat** integrated to the map view to enable *ad hoc* synchronous communication between peers and other users. The chatters can be picked up from the map

view by clicking the dots representing users. The number of participants in the discussion is unlimited, but one person may use only one chat channel simultaneously. Thus the functionality of the chat is restricted when compared to many commonly used chat services. However, the chat in EDUCO is targeted to a small exchange of ideas when searching for a team member for group work.

Of course, there is also a **search** function in EDUCO. It can be used to find both persons and documents. The search is targeted to the titles of documents and names (and nicknames) of users, both online and offline. The search results are shown in the "Search view", but also in "Map view" by highlighting the document with a blue rectangle, as can been seen in the "Map view" in Fig. 2.

Finding team members to complete an assignment is often obligatory in SCL. When searching for a companion for group work, regular search is useless unless a student already knows the person he or she is willing to team up with. However, another type of search can be used for the purpose. EDUCO's **alarm** offers each user a possibility to set "triggers" into the documents, groups and the overall system. In other words, a user can set EDUCO to alert when certain conditions occur. This feature is useful in a case where a user searches for a companion (possibly from a certain group) showing interest for a certain document or topic, or wants to contact a particular person when he or she enters the system. The alarm function also enables making combinations of triggering events. Figure 3 shows an example of a combination of triggers: the alarm will go off if "Miikka Miettinen" or "somebody from group 3" enters the system.

Figure 3. Alarm view.

2.2. Group-forming functionality

Working in groups is an essential part in student-centred learning. An important feature in EDUCO is the support for forming groups. Alarms, chat and navigational patterns can be used when screening for potential partners for group work. Another feature is a list of available (i.e. not yet in any group) participants in the environment. Every user can start a group by clicking a button "Add a new group". Other people can join such a group, or they can start a new group and try to persuade people to join. After producing a joint work, such as a report or the draft of a report, it can be published for comments in EDUCO by submitting the URL of the work.

The way group forming is handled in EDUCO is particularly suitable for a course where the groups are not stable for the entire course, and more importantly, the groups are formed by the students themselves without teacher assistance. This approach requires metacognitive skills by forcing the students to think about what kind of expertise they will need for the task at hand. The need for metacognitive skills are often coupled with domain expertise in various forms of SCL. In addition, EDUCO's group-forming approach is in line with some other modern education needs such as just-in-time learning and learning on demand.

Document icons in the "map view" of EDUCO can each represent a collection of student reports. Otherwise, the space for documents in the map could be overwhelmed with student reports, especially in large courses with weekly or semi-weekly reports.

2.3. Comments and bulletin board discussions

In addition to the synchronous discussions described above, EDUCO has two possibilities for asynchronous communications. A document in the EDUCO map can have one of these types of communication chains "attached" to it, i.e. the comments are always document-specific. A discussion chain for a report document published by a student group working together for a weekly assignment is a typical hierarchical discussion chain, where previous discussions can be quoted and a new discussion chain can be started. The discussion is meant for building knowledge together, by publishing an early version of a report for an assignment, for example, and soliciting comments from other course participants. This approach is in harmony with the idea of SCL.

Another type of comments is shown in the lower left-hand corner in Fig. 1. Whereas the documents with student reports have newsgroup-type hierarchical discussions, other documents gathered into EDUCO have a space for general notes or comments. A typical use of these comments is to ask others about an unclear point in an article, or note an issue raised in the article. Both types of comments are open to anyone in the system.

3. Empirical evaluation

3.1. Course structure and the setting

The EDUCO tool and the student-centred approach it supports were tested empirically in an advanced course in Computer Science entitled "Computer Uses in Education" with the subtitle of "Web-based learning'". The course was given at the Department of Computer Science, University of Helsinki, Finland, during the Spring semester 2002.

The format of the course followed the student-centred principles. Other courses at the Department are traditional lecture-based courses or learning-material-oriented solitary web-courses, so the approach was unique for the students. In addition, it was the first pure web-course for most of the students. There was no final exam but the students had nine weekly reports to produce from nine different topics in varying teams. Team sizes were not fixed, but groups of two or three were recommended. Moreover, the groups were not allowed to stay the same during the course. A student had to be involved with at least three different groups. Forty-six students actively participated in the course (i.e. produced at least one weekly report). Some of the students were adult learners with varying backgrounds and degrees but most of them were majoring in Computer Science.

The course fulfilled several essential ideas of SCL. Weekly assignments were presented as open-ended problems, projects or cases, such as counselling a higher education institute on what kind of course delivery system they should choose or drafting an approach on how to evaluate web courses. Learning was active since there were no lectures, so the students were held responsible for the material. In some assignments, the groups had a certain freedom in defining the objectives of their weekly report. Although the deadlines were very strict, within the deadline the students were using self-paced cooperative learning.

Apart from the documents containing the reports of the student groups, the documents in the EDUCO map discussed the issues covered during the first eight weeks. The documents were organized into eight different clusters under a common theme. The themes were close to the weekly topics but not completely the same. The document cluster sizes varied from two to ten, giving a total of ca. 40 documents. The exact amount of documents varied slightly during the course, since new resources were added or replaced occasionally.

The course included only two face-to-face meetings lasting 45 minutes. The first was an initial meeting where the structure and requirements for the course were explained. The second face-to-face meeting was organized the next day, and participants had an opportunity to get familiar with EDUCO. After that, every communication took place in EDUCO apart from some email announcements.

The course relied heavily on peer-commenting, since the teacher and the teaching assistant were not able to extensively guide or comment the reports of the student groups. The first eight topics covered different aspects of Web-based learning, such as platforms, learning theories, interaction and adaptive educational systems. The assignment for the last week was to evaluate all the reports produced during the first eight weeks and choose the most significant one from every week. Because of the nature of the last assignment, it was recommended to do that assignment alone.

3.2. Discussion about the course and the tool

Kreijns and Kirschner [7] have identified the three most common pitfalls of computer-mediated social interaction. The first pitfall is that social interaction can be taken for granted; that it will automatically happen in the computer-supported collaborative learning. The second pitfall is the tendency to forget the interaction that is salient in various levels of non-task contexts (see also [6]). The third pitfall is that asynchronous collaboration complicates social processes causing task coordination and participation problems.

In our experiment, social interaction was not a problem. Students were actually eager to seek social interaction with different participants. The instructions were that the group for weekly reports should not stay the same during the whole course, and every student has to be involved with at least three different groups. Thus, the minimum amount of study partners for each student was three. However, the average amount of partners (modified with the students who dropped out) was 6.05, ranging from 3 to 11. Working with self-organized groups was well-received by the students.

Also the amount of comments and discussion postings was relatively high, On the other hand, students knew that they are rewarded based on the comments made. Still, the majority of the postings were undoubtedly written to contribute something to the discussion and not to raise "free" points. The average amount of comments was 5.0, and the average amount of discussion postings was 16.4. The variation was remarkable, since some students did not write any discussion postings, and the most active wrote 149 well-grounded postings.

The second pitfall was deliberately avoided by encouraging the groups to meet and work together outside EDUCO. However, some of the students chose to use different Web-tools for communication and rarely met anyone in person. Many of the students still preferred to meet once or twice during the weekly assignment, even though email and other types of communication channels were heavily used to exchange ideas and draft versions of the reports. The threat of the second pitfall is still genuine. Because the teacher did not communicate with the students outside the computer en-

vironment (and the grades for reports were released only after the course), some students started to come up with speculations, such as "the report was not good if the teacher did not comment on it."

The third pitfall was a reality for a fraction of the students participating the course. Some students complained about the difficulties when trying to fit the timetables with other students during the weekly assignments. However, the majority of the students did find it flexible and meaningful to work with the synchronous and asynchronous tools that EDUCO provided[1]. The student population (Computer Science majors) could have been a factor. Many of the students have a habit to check their emails regularly, and the threshold for initiating asynchronous communication with peers is low.

The atmosphere and the feeling during the course is best described with this extract from the learning diary of a student:

> "The students started to comment freely on each others reports during the course. Legendary characters rose from the participants [...] Persons behind their names started to get 'faces' although the majority remained faceless. Emergence of group spirit was clearly noticeable, especially during the last few days when everyone was looking thru the reports and tried to find the best ones. I didn't chat with anyone in EDUCO, but seeing other students around the documents gave a feeling that there are people tackling the same tasks."

The feeling of joint effort to build knowledge together was also seen in the drop-out rate. Only three active students (students who produced at least one report) out of 46 dropped out from the course after three weekly reports. The others were active: even though only the seven best weekly reports were to be graded, only 10 students chose not to complete more than seven reports. The experiences with motivation, commitment and level of activeness are remarkably different when compared to other, traditional learning-material-oriented web-courses that were held at the department at the same time, although no formal studies were conducted on the topic.

4. Conclusions

The paper presented EDUCO, a tool for student-centred Web-based courses, and described how it was used in a university-level course. The described course is, of course, just one possibility to harness the system into Web-based education. The student responses and the learning outcomes

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[1]Many students used other forms of communication as well when trying to find study partners, including traditional email and even mobile phones.

were strongly positive and encouraged to shift the bias towards student-centred learning in subsequent web-courses.

Noticeable issues considering the research reported are that the students felt this type of SCL to be meaningful, yet the workload for teachers was significantly lower compared to the Web-courses relying on pre-made course material with quizzes and exercises. Strong reliance on peer-assisted learning and the feeling of building knowledge together enabled by the social navigation functions of EDUCO were factors reported to be contributing to the positive attitude towards the course in the student feedback.

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